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Real exchange rate volatility, terms-of-trade shocks, and financial integration in primary-commodity exporting economies

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HIGHLIGHTS

- We utilize a panel of 53 primary-commodity exporting countries for 1980–2007.
- Let international financial integration be IFI, and let terms-of-trade be TOT.
- We focus on the interactive role of IFI in reducing real exchange rate volatility.
- Greater IFI reduces the impact of TOT shocks on real exchange rate volatility.
- This reduction is larger when we measure IFI by foreign direct investment.

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ABSTRACT

Using a panel of 53 primary-commodity exporting countries, we show that greater international financial integration reduces the impact of terms-of-trade shocks on real exchange rate volatility. This reduction is larger when we define financial integration as foreign direct investment.

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1. Introduction

This study examines the effects of terms-of-trade shocks on real exchange volatility for primary-commodity exporting countries that have become more financially integrated with the rest of the world. In particular, we want to see whether greater financial integration exacerbates or mitigates the effects of terms-of-trade shocks on real exchange rate volatility. Our study contributes to the literature in three noteworthy aspects. First, we differ from previous studies which focus on the level effect of greater financial integration on real exchange rate volatility and overlook the interactive role of financial integration (see, for instance, Calderón and Kubota, 2009, and Hviding et al., 2004). Second, our sample includes small primary-commodity exporting countries in which one or two commodities dominate the exports.[1] As such, our examination focuses on the terms-of-trade shocks that are both dominant and exogenous. Third, we take note of the notion that the impact of greater financial integration on real exchange rate volatility may depend, among other factors, on the composition of foreign assets and liabilities. As such, we consider a long-term oriented (foreign direct investment) measure of financial integration and two short-term oriented (portfolio debt and portfolio equity investment) measures of financial integration for our analysis.

We utilize the data from 53 small primary-commodity exporting countries for the period 1980–2007. Our methodology focuses on the long-run relationship by taking five-year non-overlapping windows. We employ the Generalized Method of Moments (GMM) to estimate real exchange rate volatility based on a dynamic panel

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[1] The list of primary-commodity countries is taken from Cashin et al. (2004).

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data model with several fundamental volatility measures and structural determinants. Our findings reveal that the terms-of-trade effects on real exchange rate volatility are reduced as the economy becomes more financially integrated. Such evidence is in line with the recent theoretical predictions of open economy macroeconomics (Buch et al., 2005; Sutherland, 1996).

The format of this study is as follows: Section 2 presents a brief literature review and then describes the methodology and data. Section 3 discusses the empirical results. Section 4 concludes this study.

2. Literature review, methodology, and data

Hausmann et al. (2006) show that real exchange rates are three times more volatile in developing countries than in developed countries. One source, often cited in the literature, is the terms-of-trade which displays greater volatility due to the fact that primary commodities (whose prices are subject to wide fluctuations in world markets) constitute a significant component of the exports in developing countries (Cashin et al., 2004; De Gregorio and Wolf, 1994).

Recent empirical literature has also documented an increasing financial integration of developing countries with global financial markets. Reasons for this trend include easing restrictions on capital movements and the growing stock of foreign assets and liabilities that have been accumulated through capital flows (Kose et al., 2009). Greater financial integration may exacerbate or mitigate the impact of shocks to the economy. On the one hand, foreign capital flows (particularly, short-term) display significant pro-cyclical behavior, leading to the argument that greater financial integration may actually amplify the impact of shocks to the economy. On the other hand, greater financial integration may mitigate the impact of shocks by helping a country stabilize domestic consumption and investment spending through international risk-sharing and inter-temporal substitutions.

With this in mind, we ask whether greater financial integration with the rest of the world has exacerbated or mitigated the effects of terms-of-trade shocks on real exchange rate volatility in primary-commodity exporting countries.[2] In answering this question, we focus on the following real exchange rate volatility equation:

$$\begin{aligned}\mathrm{Vol}\,(\mathrm{REER}_{it}) = {} & \Phi X_{it} + \Gamma Z_{it} + \gamma \left(\mathrm{TOT}_{it}^{\mathrm{shock}} * \mathrm{IFI}_{it}\right) + \mu_i \\ & + \varphi_t + \varepsilon_{it} \qquad (1)\end{aligned}$$

where $\mathrm{Vol}\,(\mathrm{REER}_{it})$ is the real effective exchange rate volatility calculated as the annual standard deviation over five-year non-overlapping periods to filter out business cycle fluctuations (Aguiar and Gopinath, 2007); X_{it} is a vector of fundamental volatility measures including terms-of-trade shocks, real output growth shocks, government spending shocks, and monetary shocks[3]; Z_{it} is a vector of control variables including consumer price inflation, real output per capita gap, degree of trade openness, level of international financial integration, degree of financial development, and degree of flexibility in the exchange rate regime; $\mathrm{TOT}_{it}^{\mathrm{shock}}$ is the terms-of-trade shock and IFI_{it} is a measure of international financial integration; μ_i is the country-specific effect while φ_t is the period-specific effect; and ε_{it} is the error term.

Our sample includes the data from 53 small primary-commodity exporting countries for the period 1980–2007.[4] The Appendix lists the countries and provides more detailed information on the variables. In estimating Eq. (1), we utilize the Generalized Method of Moments (GMM) dynamic panel data model developed by Arellano and Bond (1991) in order to address the issue of joint endogeneity of explanatory variables with the error term and the potential biases caused by country-specific effects and omitted variables. Crucial to the purpose of this study is the sign of γ in Eq. (1). For instance, $\gamma < 0$ indicates that greater financial integration mitigates the effects of terms-of-trade shocks on real exchange rate volatility.

For a comprehensive examination, we utilize five different measures of international financial integration. The first definition includes the total stocks of gross foreign liabilities and foreign assets (calculated as the sum of foreign direct investment, portfolio debt investment, portfolio equity and other investment, and official reserves).[5] The estimates of Eq. (1) with this definition are reported in column 1 of Table 1. The second definition includes only foreign direct investment (as the long-term oriented financial integration measure). The estimates of Eq. (1) with this definition are reported in column 2. The third, fourth, and fifth definitions include, respectively, total portfolio debt plus equity investment, portfolio debt investment, and portfolio equity investment (as the short-term oriented financial integration measures).[6] The estimates of Eq. (1) with these definitions are reported, respectively, in columns 3, 4, and 5 of Table 1.

3. Main results

The estimates of Eq. (1) in columns 1–5 (with alternative measures of financial integration) pass a series of diagnostic tests including the Sargan test and the test for a second order serial correlation. Further, these estimates are robust to the use of 3-year (instead of 5-year) averages of the variables and to alterations in determinants and sample coverage.[7]

Consistent with other studies including Calderón and Kubota (2009) and Hau (2002), the parameter estimates on different measures of fundamental volatile and other determinants in columns 1–5 have theoretically correct signs. According to the estimates in column 1, the parameter estimates on the level of financial integration is positive, suggesting that higher stocks of foreign assets and liabilities increase real exchange rate volatility. The parameter estimates on the interactive term are negative, suggesting that financial integration significantly reduces the impact of terms-of-trade fluctuations on real exchange rate volatility. For instance, a 10% increase in the stocks of total foreign assets and liabilities will increase real exchange rate volatility by 1.08% but reduce the impact of the terms-of-trade shocks on real exchange rate volatility by 2.89%.

A closer look at the results in columns 2 and 3 indicate that financial integration defined as foreign direct investment has no effect on real exchange rate volatility but dampens the effect of terms-of-trade shocks on real exchange rate volatility more substantially than financial integration defined as total portfolio investment (i.e., the parameter estimate on the interactive term in column 2 is −1.135 while that in column 3 is −0.268). This finding is consistent with the view that financial integration oriented toward long-term capital flows could result in lower fluctuations

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[2] Aizenman and Riera-Crichton (2008) show that greater stocks of foreign exchange reserves reduce the impact of terms-of-trade on annual real exchange rate changes for emerging market economies.

[3] The construction of these volatility measures is similar to that of real exchange rate volatility.

[4] The sample period ends with 2007 due to the availability of the international financial integration measures adopted from Lane and Milesi-Ferretti (2007).

[5] As discussed by Kose et al. (2009), the use of gross stocks is preferable to annual capital flows, as the latter tend to be more volatile and prone to measurement error. In addition, the use of gross stocks, compared to net stocks, provides a better measure of integration and efficient risk-sharing as it captures two-way interactions between economies with different risk portfolios.

[6] Unlike foreign direct investment, portfolio debt and equity investment display more instability and vulnerability to financial crises.

[7] Results are available from the author upon written request.

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